SEPARATION OF URINE FROM MUNICIPAL SEWAGE FOR PREVENTION OF WATER POLLUTION

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Sustainable sanitation technologies aim at saving human excrements for recycling. One possible technology are separation toilets. Such toilets collect urine and faeces separately at the source, i.e. when using the toilet. In Sweden, several projects are under construction respectively in use which test separation toilets. The urine is collected in tanks in order to use it directly in agriculture. This strategy is useful not only for recovery of the nutrients but also for prevention of water pollution. First of all, most of the nutrients are excreted in urine not in faeces. Most of the nitrogen and phosphate in municipal waste water are from human urine. Separation of urine from municipal sewage will avoid the overload of the nutrients to the water environment and will stop the nutrification. Secondly, this strategy will solve the problem of endocrine disruptor in water environment. To verify this hypothesis, we examined the fate of the human estrogen in municipal sewage.

Natural estradiol (E2) form human urine is the most potent endocrine disrupter in the water environment. Estrogens are excreted in urine as the conjugates, predominantly as glucuronides and sulfates forms. We measured the free E2 and its conjugates in human urines (both male and female) and municipal sewage. In human urines, almost all the E2 was the conjugates and free form was less than 1 % in both male and female urines. In human urines, the glucuronides were predominant (male 85%, female 65%), and remaining were the sulfates (male 15%, female 35%). In contrast, 10% of E2 in municipal sewage was the free form, and the dominant conjugates were the sulfates (75%). We found the glucuronidase activity, probably from human feces, in the municipal sewage. But the sewage did not show any sulfatease activity.

Next, we investigated the fate of the estrogens in municipal sewage treatment plant, by using both yeast estrogen assay and ELISA for E2. The treatment plant is employing the authentic activate sludge system. Estrogenic activity, estimated by yeast assay, in raw sewage was about 150 ng E2 equivalent /L, and the E2 concentration of the same water was 50 ng/L. This suggests the presence of the other estrogenic substances in sewage water. In contrary, almost all the estrogenic activity in the effluent from the treatment plant was explainable by contribution of E2, and the concentration was about 10 ng/L. The similar range of concentration was found in many other Japanese waste water treatment plants. We conclude that the treatment efficiency of E2 in authentic activate sludge process is up to 80%. In conclusion, removal of the natural estrogen from municipal sewage is not enough under authentic activate sludge system. To avoid this problem, urine separation will be one of the promising choices.